AMENDMENTS TO THE CLAIMS

1. (**Currently Amended**) A method ~~for reconstructing a bioluminescent source distribution within an object~~, comprising:

imaging [[the]]an object using a tomographic imaging device to produce a ~~first~~ reconstructed image;

mapping optical absorption properties and scattering properties of the object to the ~~first~~ reconstructed image, resulting in mapped optical properties;

detecting internally derived bioluminescent signals emitted from the object using a bioluminescent imaging device, wherein the internally derived bioluminescent signals are not reliant on external energy excitation; and

reconstructing a bioluminescent source distribution of the object from the internally derived bioluminescent signals based at least on the mapped optical properties, wherein the reconstructing step comprises generating an imaging matrix of coefficients dependent on the mapped optical properties and an anatomical structure of the object by solving[[with]] a radiative transfer equation or an approximation to the radiative transfer equation via at least one of a finite-element method, a mesh-free method, or a Monte Carlo simulation.

2. (**Currently Amended**) The method of claim 1, ~~wherein~~ further comprising supplying, via the ~~first~~ reconstructed image, ~~shows~~ two-dimensional or three-dimensional structural details of the object.

3. (**Currently Amended**) The method of claim 1, ~~wherein~~ further comprising supplying, via the bioluminescent source distribution, ~~shows~~ two-dimensional or three-dimensional distribution of light emission from the object.

4. (**Currently Amended**) The method of claim 1, wherein the step of reconstructing further comprises reconstructing the bioluminescent source distribution ~~is reconstructed~~ to represent multiple types of source distributions with various spectral characteristics.

5. (**Currently Amended**) The method of claim 1, wherein the step of reconstructing further comprises reconstructing the bioluminescent source distribution ~~is reconstructed~~ from a single angle of view or multiple angles of view.

6. (**Currently Amended**) The method of claim 1, wherein the step of reconstructing further comprises reconstructing the bioluminescent source distribution by ~~is reconstructed~~ using an iterative approach or an analytic approach.

7. (**Canceled**)

8. (**Currently Amended**) The method of claim 7, wherein the step of detecting optical signals [[also]] further comprises utilizing ~~uses~~ optical path components for one or more paths.

9. (**Currently Amended**) The method of claim 1, ~~wherein~~ supplying, via the bioluminescent source distribution, ~~shows cross-sectional or volumetric views of the object or~~ quantitative features of underlying source distributions of the object.

10. (**Currently Amended**) The method of claim 1, wherein the optical absorption properties and the scattering properties of the object comprise~~include~~ at least one of absorption coefficients, scattering coefficients, scattering anisotropy, indices of refraction, and features of underlying sources.

11. (**Currently Amended**) The method of claim 1, wherein the imaging step comprises configuring a tomographic imaging modality, wherein the tomographic imaging modality includes at least one of x-ray computed tomography, ~~micro computed tomography,~~ magnetic resonance imaging, [[and]] or ultrasound.

12. (**Canceled**)

13. (**Currently Amended**) The method of claim 1, further comprising segmenting the ~~first~~ reconstructed image into at least one region~~s~~, wherein the step of mapping maps the optical

absorption properties and the scattering properties of the object to the at least one ~~each segmented~~ region of the image.

14. (**Currently Amended**) The method of claim 1, further comprising registering the ~~first~~ reconstructed image with [[the]] detected optical signals before producing the bioluminescent source distribution.

15. (**Currently Amended**) The method of claim 14, wherein the step of registering comprises registering the reconstructed image with the detected optical signal by using ~~uses~~ a landmark-based method, a land-mark free method, or an optical surface imager method.

16. (**Currently Amended**) A system ~~for reconstructing a bioluminescent source distribution within an object~~, comprising:

a tomographic imaging device for imaging [[the]]an object to produce a ~~first~~ reconstructed image;

a library of optical absorption properties and scattering properties of the object, based at least on available data ~~measured previously~~;

a processor for mapping the optical absorption properties and scattering properties of the object to the ~~first~~ reconstructed image, resulting in mapped optical properties; and

a bioluminescent imaging device comprising one or more imagers sensitive to one or more internally derived bioluminescent sources of spectral characteristics, wherein the internally derived bioluminescent signals are not reliant on external energy excitation, and wherein the bioluminescent imaging device is configured for

detecting internally derived bioluminescent signals emitted from the object by using the one or more imagers, and

reconstructing a bioluminescent source distribution of the object based at least on the mapped optical properties, wherein the bioluminescent source distribution is produced using a radiative transfer equation or an approximation to the radiative transfer equation.

17. (**Currently Amended**) The system of claim 16, wherein the ~~first~~ reconstructed image ~~shows~~ conveys two-dimensional structural details or three-dimensional structural details of the object.

18. (**Currently Amended**) The system of claim 16, wherein the bioluminescent source distribution ~~shows~~ conveys two-dimensional distribution or three-dimensional distribution of light emission from the object.

19. (**Currently Amended**) The system of claim 16, wherein the bioluminescent source distribution is reconstructed to represent multiple types of source distributions with at least one ~~various~~ spectral characteristic~~s~~.

20. (**Currently Amended**) The system of claim 16, wherein the bioluminescent source distribution is reconstructed from a single angle of view or multiple angles of view.

21. (**Currently Amended**) The system of claim 16, wherein the bioluminescent source distribution is reconstructed using an iterative approach or an analytic approach.

22. (**Currently Amended**) The system of claim 16, wherein the ~~optical~~ bioluminescent imaging device utilizes[[uses]] sensors for detecting [[the]] emission of optical signal ~~emissions~~.

23. (**Currently Amended**) The system of claim 22, wherein the ~~optical~~ bioluminescent imaging device further comprises optical path components.

24. (**Currently Amended**) The system of claim 16, wherein the bioluminescent source distribution ~~shows~~ conveys ~~cross-sectional or volumetric views or~~ quantitative features of [[the]]at least one underlying source distribution~~(s)~~.

25. (**Currently Amended**) The system of claim 16, wherein the optical properties include at least one of absorption coefficients, scattering coefficients, scattering anisotropy, indices of refraction, and features of underlying bioluminescence sources.

26. (**Currently Amended**) The system of claim 16, wherein the tomographic imaging device enables a tomographic imaging modality comprising ~~includes~~ at least one of x-ray computed tomography scanning, micro computed tomography scanning, magnetic resonance imaging, micro magnetic resonance imaging, [[and]]or ultrasound imaging.

27. (**Canceled**).

28. (**Currently Amended**) The system of claim 16, wherein the processor segments the ~~first~~ reconstructed image into at least one region~~s~~ and maps the optical absorption properties and the scattering properties of the object to the at least one~~each segmented~~ region ~~of the image~~.

29. (**Currently Amended**) The system of claim 16, wherein the processor registers the ~~first~~ reconstructed image with [[the]] detected optical signals before the bioluminescent source distribution is produced.

30. (**Currently Amended**) The system of claim 29, wherein the processor registers the reconstructed image with the detected optical signals by ~~performs registration~~ using a landmark-based method, a landmark-free method, or an optical surface imager based method.

31.-90. (**Canceled**)